Amendments to the Drawings:

The attached drawing sheets 1 & 2 include changes to Figs. 1, 5, and 6. Sheet 1, which includes Fig. 1-4, replaces the original sheet 1 that includes Fig. 1-4. In both Figs. 1 and 5, the previously described, but not shown, birefringent incoming photon direction of travel 102, incoming optical fiber 104, and crystal 106, are included to more explicitly depict the state distinguisher feature of the present invention. In Fig. 6, the (unnumbered) upward and downward spin direction labels in fourth sector 626 and ninth sector 652 have been omitted to avoid an unwarranted implied restriction on the potential states that can take either of the paths 628 and 630 in fourth sector 626, and either of the paths 646 and 648 in ninth sector 652.

Attachment: Replacement Sheets 1 and 2.

REMARKS/ARGUMENTS

In response to the Examiner's office action of June 6, 2006, applicant respectfully requests that the Examiner consider the following remarks and arguments as well as the above detailed amendments.

The informality in claim 8 was a typographic error and has been corrected.

The Examiner's drawing objection that the "state distinguisher" is not shown is accurate for Figs. 1 & 5, as was originally so stated in the specification, but is not accurate for Fig. 6. In Fig. 6, the already depicted state distinguisher is the magnetic field B_0 in the first sector 615, and paragraph [0071] of the specification has been amended to more explicitly identify that the magnetic field B_0 in the first sector 615 indicates that the state distinguisher is present in Fig. 6. Explicit depictions of the state distinguisher, in the form of the already described bi-refringent crystal **106**, have been added to Figs. 1 and 5, and paragraphs [0055] and [0057] have been amended to more explicitly clarify this identification.

The Examiner's drawing objection that the "state conditioner" is not shown is judged to possibly be a misunderstanding, because the "state conditioner" is shown. In Figs. 1 & 5, the half wave plate 120 is a state conditioner, and paragraphs [0055], [0057] and [0058] have been amended to more explicitly clarify this identification. In Fig. 6 the state conditioner is disposed in the fourth sector 626 and paragraph [0071], in addition to the aforementioned paragraph [0055], has been amended to more explicitly clarify this identification.

The Examiner's drawing objection that the "interference actuator" is not shown is also judged to possibly be a misunderstanding, because the interference actuator is shown. As originally stated in the paragraph [0058] description of Fig. 1, "The destructively interfering operation is accomplished by the crossing of the paths 112 and 114 at the interference zone 130", and hence these elements comprise the interference actuator in the focused intersection optical apparatus embodiment 100. Paragraphs [0055]

and [0058] have also been amended to more explicitly clarify this identification. In Figs. 2-4, the crossings of the paths 112 and 114 are also shown. In Fig. 5, the free space between the emission plane 516 and the detection plane 524 in which the photon's available paths from locations 512 and 514 are capable of intersecting is the interference actuator as described in paragraph [0068], which has been amended to more explicitly clarify this identification. In Fig. 6 the magnetic field $-B_0$ 625 disposed in the fifth sector 631 functions as the interference actuator of the interference which is capable of being manifest in the seventh region 640 as already described in paragraph [0072], which has also been amended to more explicitly clarify this identification.

The Examiner's rejection of claims 1-108 as failing to comply with the enablement requirement of 35 U.S.C. 112 by failing to adequately teach and/or discuss the function/performance of "a state distinguisher," "a state conditioner" and/or "a preparatory conditioner," and/or "an interference actuator" is herein contended to be a misreading of the specification's description. Both as detailed immediately above, and as further detailed in the majority of the specification, these elements of the invention are well enabled. The identifications of the teachings of the above elements at issue in regard to enablement are further clarified in amended paragraph [0055]. Paragraph [0055] additionally elucidates that elements of the present invention which are capable of effecting the eigenstate distinguishing operation are the state distinguishers; elements that are capable of effecting either or both of the eigenstate altering operation and the phase aligning operation are the state conditioner (or, when appropriate, preparatory conditioner); and elements that are capable of effecting the destructively interfering operation (or related operations that are capable of revealing manifestations of interference) are the interference actuators. It was and is expected that the correspondences between these operations and their respective element terms was more than sufficiently described heretofore to enable one of ordinary skill in the art of the manipulation of entities capable of quantum interference to be able to practice the present invention, but it is accepted that

additional illumination is preferred by the Examiner and hence the above amendments have been executed to provide this additional material.

The Examiner's rejection of claims 1-108, as understood by the Examiner, under 35 U.S.C. 102(e) as being anticipated by Nambu 6,801,626 is respectfully asserted to be mistaken. The source of this misperception appears to primarily be a mischaracterization of the disclosure of Nambu. In regard to the Examiner's assertions regarding the teaching of Nambu, it is firstly important to understand that the features cited from the Nambu disclosure are paraphrased from the art prior to Nambu, not from the Nambu invention itself, and that they are best understood in light of the references from which they are taken as identified by Nambu: "The two-state scheme, known as the B92 protocol, is described in Physical Review Letters Volume 68, Number 21, May 1992, Charier. H. Bennett, pages 3121 to 3124 (hereinafter Reference 6) and Physical Review Volume 30, Number 2, August 1994, A. K. Eckert, B. Huttner, G. M. Palma and A. Peres, pages 1047 to 1056 (hereinafter Reference 7)." An important correction to this Nambu quote is that the second listed reference, termed Reference 7, is misidentified; its accurate identification is Physical Review Volume 50, Number 2, August 1994, A. K. Eckert, B. Huttner, G. M. Palma and A. Peres, pages 1047 to 1056. The most comprehensive and accurate understanding of Nambu will be achieved by considering their teachings in addition to the disclosure of Nambu.

Referring now to the Nambu characterization in detail, the Examiner asserts that part 22, generically identified by Nambu as a "beam-splitter," is a state distinguisher, which is incorrect. A beam-splitter, unless specifically further identified as being combined with further element that provides an additional functionality, is in fact a state non-distinguisher. A beam splitter divides a beam according to the relative ratio of its coefficient of transmission T and its coefficient of reflection R. The primary differentiation among standard beam-splitters, other than variations in these coefficients, is the type of phase change induced in the reflected wave, but a change in phase is not a change in state. It is hence certain that the beam-splitter 22 is not a state distinguisher. This fact is further verified by noting that in the Nambu

description of the light pulses 23 and 24 (not "state components" 23 and 24 as characterized by the Examiner) there is no description at all of any differences in the internal degrees of freedom of the pulses 23 and 24 as there would be if the beam-splitter 22 actually was a state distinguisher. The only distinction between pulses 23 and 24 is a 180 degree phase shift induced by the phase modulator 25 (which is not a phase aligner, since it is specifically non-aligning the phases of pulses 23 and 24) that operates after beam-splitter 22 and hence the beam-splitter 22 does not even produce a specific phase distinguishing effect, that would still not be a state distinguishing effect, when spitting the light pulse 21.

The Nambu parts 25, 26, 27, 28, and 29 are collectively characterized by the Examiner as a state conditioner, but this is incorrect. The light modulator 25 induces a randomized phase modulation of the light pulse 23, which is hence inherently not a conditioner, since its effect is non-deterministic and hence can not be considered to provide a controlled conditioning effect as is produced by the present invention. Parts 26 and 27 are merely transmission arms of a Mach-Zehnder interferometer and have absolutely no state conditioning or any other form of state affecting action. Part 28 is a beam-splitter, and also has no sort of state conditioning effect but instead induces a combining effect of the light pulses that enter its input arms. Part 29 is characterized by Nambu as a phase detector that directs particular "0" and "1" bit pulses to specific photodetectors 30 and 31. Not only is this not a state conditioning effect, but a pulse directing effect, as described by Nambu, that is not specifically described as being state germane cannot be assumed to be state germane without such a characterization. It is believed that at least a portion of the Examiner's misperception of the Nambu patent is due to errors in the Nambu patent itself. For example, Nambu characterizes the phase detector 29 as controlling the phase difference between light pulses 23 and 24 so that certain output pulses are directed to photodetector 30 and other light pulses are directed to photodetector 31, but this is not possible since phase detector 29 has no capacity to interact with light pulse 24, and since such a directing effect must occur after beam-splitter 28, not before. Nambu does not even consistently identify the parts cited, since in Nambu's Fig. 2 the part 29 is labeled a phase detector while in the written description Nambu terms part 29 a "phase modulator." After inspection of the

original references cited by Nambu, it is the applicant's belief that Nambu, at minimum, did not fully appreciate the operation of the protocol cited, since it is wrongly described. The protocol described by Nambu does not correspond accurately to the references cited by Nambu, and hence applicant is not able to fully diagnose the complete nature and extent of Nambu's errors.

The beam-splitter 28 is capable of being used in a properly configured apparatus as a part of an interference actuator, but is not such by itself any more than a tire by itself is an automobile. The beam-splitter 28 does not produce self-interference by an entity, rather it is again only potentially a part of an apparatus that might produce self-interference. Photo detectors 30 and 31 are not interference responders, as characterized by the Examiner, since their functioning and/or outputs do not specifically vary as an indication of whether or not the photons they respond to are manifestations of interference. They are only indicators of whether or not a photon was directed to them, irrespective of whether or not the photon may have been affected by an interference effect.

What the Examiner characterizes as a state distinguisher (seemingly intended by the Examiner to indicate beam-splitter 22) is definitely not a state distinguisher, and there is not even a hint of a state distinguishing effect between the states of light pulses 23 and 24, especially since there is no difference in state between them. Nowhere in Nambu, or the references cited by Nambu, is there any indication of a state difference between pulses 23 and 24, nor is it even possible for them to differ in internal state if the rest of Nambu's intended functions are to be capable of operating. The Examiner's identification of "a first subset and a second subset of the component states" is not part of the disclosure of Nambu, and is inaccurate if it is intended to be a paraphrasing of Nambu. Since Nambu and its cited references are intended to work with only very low intensity light pulses, they assume that only one photon will be in the apparatus at a time, and hence the only difference between the pulses 23 and 24 will be their probability amplitudes (i.e. complex number valued square roots of their probabilities of being measured.)

The Examiner asserts, in describing Nambu, that: "The state conditioner includes a light modulator (25), quantum channels (26, 27), a phase detector (29) which are capable of selectively state altering

operation, if so desired." With all due respect, these characterizations are distinctly incorrect. None of these parts, even if described correctly, are intended to, described as, or capable of affecting the state of the light pulses 23 or 24, and thus are not at all "capable of selectively state altering operation". The components described are only capable of impacting on the probability amplitude and phase of a light pulse, and are not applicable to the light pulses' quantum states nor are they remotely capable of altering these states, whether desired or not. Nambu does not address component states that also include an eigenstate of an observable of the entity, and hence such a characterization of Nambu is invalid, though even if valid, it would not bring Nambu any closer to being anticipatory; every quantum state is describable as having at least one eigenstate of an observable as a component of its state as expressed in a projection on a given set of orthonormal basis states, and hence this characterization is just a statement of a pervasive aspect of physical reality and is not relevant to the novelty of the present invention.

The Examiner's reference to an interference actuator is not apt, since, as detailed above, the Nambu sections cited do not describe an interference actuator. Furthermore, there is only one mention of anything relating to temporality in Nambu, and that mention in Col. 5, line 39 applies to the Nambu invention, not to the components of the prior art that the Examiner has cited. Where Nambu does mention temporality, it is in reference to: "an optical switch for switching outputs of the phase modulator and the optical transducer into a temporally mixed light pulse sequence and transmitting the mixed light pulse sequence over an optical communication link," which applies to a means of preparing a sequence of light pulses for transmission and not to any sort of interference actuating. The Examiner's reference to an interference responder is also not apt, since, as detailed above, the Nambu sections cited do not describe an interference responder. The "0" and "1" bit pulses are not positive and/or negative manifestations of interference. It is important to note that the (incorrect) Nambu summary of the prior art, is best understood by considering the purpose and operation of the prior art. These papers on quantum cryptography are attempts to provide a means of transmitting an encryption key over a channel that is potentially compromised by eavesdropping. The protocols described are attempts to provide a

statistically certain approach to transmitting at least one such key that is not intercepted, and enabling the users to identify that still secret key for encrypting a message. They are not focused on conditionally enacting interference or potentially responding to manifestations of interference. They merely use unavoidable effects on phase relations, which result whenever an eavesdropper "listens" to the communication channel, to reveal the presence of the eavesdropper and to reveal when an eavesdropper is not present, and the transmitted key is secure for use.

Claims 1-108 remain in this application. The specification already included sufficient support and teaching for all of the claimed elements, and additional elaboration and specific terminological detailing to reiterate the basis for the support of the various elements has been added by way of amendment. The drawings and claims have been amended to traverse the Examiner's objections. The portions of the prior art reference cited by the Examiner as a basis for the claim rejections have been shown to be defective on their face; not applicable to the present invention; not indicative of the Examiner's contentions that they are descriptive of the elements, steps, functions, or capabilities of the present invention, and not relevant to the general realm of operations of the present invention. It is therefore concluded that the Examiner's objections and rejections have been addressed and traversed with no new matter having been added, and applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

KLOTZER PATENTS

By_____

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